(Translation)

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Specification

1. Title of the Invention
Magnetic Recording and Reproducing Device

2. Claims
1. A magnetic recording and reproducing device comprising a scheduling recording function of a desired program, in which an additional signal including the data of a program name, channel number, broadcast date, and if necessary, offset time, is multiplexed to a television signal of a program to be broadcasted, and received, the magnetic recording and reproducing device being characterized by comprising:

an additional signal separation unit (10) for separating the additional signal from the television signal of a received program;

a storage unit (28) for adding and storing a code number and index for the received program, and having a content of the separated additional signal as the additional data;

a means for recording the code number corresponding to the program on the video tape to indicate a recording area of the received program of the video tape;

a means for recording a table of the additional data, the code number and the index for a recorded program of the video tape stored in the storage unit, in a predetermined area of the video tape;

a means for reproducing the table from the predetermined area of the video tape and storing in the storage unit (28);

a means for reading the table of the storage unit (28) and displaying the index and the additional data;

a means for designating a desired program recorded on the video tape from the displayed index and additional data; and

a means for performing a search of the desired program designated by the code number recorded on the video tape.

2. A magnetic recording and reproducing device, according to claim 1, being characterized by comprising:

a means for detecting a time difference between an actual broadcast time and a broadcast scheduled time of a recording scheduled program from a content of the additional signal separated at the additional signal separation unit (10); and

a means for changing and resetting a recording time of the recording scheduled program by the time difference.

3. A magnetic recording and reproducing device, according to claim 1 or 2, characterized in that a recording area of the table at the video tape is set to a head part or an end part of the video tape.

3. Detailed Description of the Invention

[Industrially Applicable Field]

The present invention relates to a magnetic recording and reproducing device of a television signal (hereinafter, referred to as TV signal), particularly to a magnetic recording and reproducing device comprising a search function of a program recorded on the video tape.

[Prior Art]

A typical device for recording and reproducing a TV signal is a video tape recorder (hereinafter, referred to as VTR) which records and reproduces the TV signal on a video tape.

Recently, the spread of VTR is dramatic, and many families have 2 VTRs per family. AV systems which consist of various kinds of video appliances including VTR (video camera, video disk, etc.) and audio appliances are considered to spread in

the future. In this way, as the AV systems spread, for example, as described in the Japanese Laid-Open Publication No. 62-208768, appliances which are more conveniently designed as a whole and individually will be demanded.

[Problems to be Solved by the Invention]

The performance of the VTR is improving more and more, and for the recording time, the triple speed mode is used more often than the standard speed mode. Common video tapes have recording time for 60 minutes, 120 minutes and 160 minutes in the standard speed mode. When these video tapes are recorded in the triple speed mode, the recording time is 3, 6 and 8 hours, respectively.

The usage of the VTR mainly includes recording and storing the TV program, changing the TV view time (so-called time shift), reproducing commercial software, reproducing the recording by a camera, and the like. Among the above, for those other than reproducing the commercial software, the recorded content must be written onto the tape cassette by someone. Otherwise, time is needed to search what kind of content is recorded on the tape cassette, and it is troublesome.

For recording and storing of the TV program and recording by a camera, since in most cases the recorded content is stored for a long time, once the title of each program and the like is written onto the tape cassette, it can be known as to what kind of program is recorded on which tape cassette. In this case, for example, the video tape is first rewound, the tape counter is reset, and the counter value and the recorded content thereafter are written onto the tape cassette of the video tape. Due to that, the recorded program which is desired to be reproduced can be found by looking at the counter value. However, such performance requires extreme amount of time and work. When using the VTR as a time shift in TV broadcast time, since the program to be recorded on the video tape frequently changes, it is necessary to rewrite the title and the like by someone each time the program changes, and it is very troublesome.

Moreover, the following disadvantage may occur. When reproducing the program after the scheduled recording of a TV program, the program which was broadcast before the program desired to be recorded may be recorded instead of the program desired to be recorded, or the program desired to be recorded may be recorded until half-way, and the like. The reason why this happens is caused by the change in broadcast time such as the change in program broadcast time due to large accidents and large happenings, or extension of broadcast time of baseball broadcast and the like.

The purpose of the present invention is to overcome the problems, reducing work for the setting operations of the data for program search, and to provide a magnetic recording and reproducing device which is capable of enhancing the operability and reliability of the search, and enhancing the reliability of program scheduling.

[Means for Solving the Problems]

In order to attain the aforementioned purpose, in the present invention, an additional signal with the content of a program name, channel number, broadcast date and the like of a program, is superposed to a TV signal of a program, and the present invention comprises an additional signal separation unit for separating the additional signal from the TV signal of a received program; a storage unit for adding and storing a code number and index for the received program, and having a content of the separated additional signal as the additional data; a means for recording the code number corresponding to the program on the video tape to indicate a recording area of the received program of the video tape; a means for recording a table of the additional data, the code number and the index for a recorded program of the video tape stored in the storage unit, in a predetermined area of the video tape; a means for reproducing the table from the predetermined area of the video tape and storing in the storage unit; a means for reading the table of the storage unit and displaying the index and the additional data; a means

for designating a desired program recorded on the video tape from the displayed index and additional data; and a means for performing a search of the desired program designated by the code number recorded on the video tape.

Moreover, the present invention comprises a means for detecting a time difference between an actual broadcast time and a broadcast scheduled time of a recording scheduled program from a content of the additional signal separated at the additional signal separation unit; and a means for changing and resetting a recording time of the recording scheduled program by the time difference.

[Functions]

When the additional signal is separated from the TV signal received at the additional signal separation unit, the content of this additional signal is stored in the storage unit as the additional data. At this time, the code number and index corresponding to the received program are added onto this additional code. When the program of the received TV signal is recorded on the video tape, the code number for this program is recorded so as to represent this program recorded area of the video tape. Moreover, the code number, index and additional data of each program in the storage unit are recorded onto the predetermined area of the video tape as a table of programs recorded on the video tape.

Therefore, the table is stored on the video tape, and even when the video tape is removed from the set main body, the table representing the program recorded on the video tape is secured.

Upon program searching, the table can be reproduced and displayed from the video tape, and due to this, the designation of the desired program is possible.

When there is a change in the broadcast scheduled time of the broadcast program, the time difference between the broadcast scheduled time and the actual broadcast time can be detected from the content of the additional signal of another program which is broadcast at the broadcast scheduled time of

a recording scheduled program. Due to this, the broadcast scheduled time of the recording scheduled program can be reset by shifting for only that time difference. Thus, the recording scheduled program can be recorded at the reset broadcast scheduled time, and the recording of this program is correctly performed.

[Examples]

Hereinafter, the examples of the present invention are described by the drawings.

Figure 1 is a block diagram showing an example of a magnetic recording and reproducing device of the present invention. 1 is an antenna, 2 is an input terminal, 3 is a tuner, 4 is a tuning unit, 5 is an intermediate frequency amplification unit, 6 is a signal processing unit, 7 is a recording processing unit, 8 is a recording head, 9 is a video tape, 10 is an additional signal separation unit, 11 is a reproducing head, 12 is a reproducing processing unit, 13 is a character generating unit, 14 is a converting switch, 15 is a video output terminal, 16 is a RF converter, 17 is a RF output terminal, 18 is recording and reproducing processing unit, 19 is a recording and reproducing head, 10 is control signal processing unit, 21 is a control head, 22 is a microcomputer (hereinafter, referred to as micon), 23 is a power input detecting unit, 24 is an operational key unit, 25 is a scheduling switch detecting unit, 26 is a scheduling date setting unit, 27 is a cassette receiver detecting unit, and 28 is a storage unit.

In the same diagram, additional signals of program names, channel numbers, broadcast date, time difference between the broadcast scheduled time and the actual broadcast time, and the like are multiplexed to the TV signal transmitted from each broadcast station. The additional signals are provided from the antenna 1 to the tuner 3 through the input terminal 2. At the tuner 3, the TV signal of the desired channel is selected by the tuning unit 4, and it is converted to intermediate frequency at the intermediate frequency amplification unit. The TV signal

of the intermediate frequency is provided to the signal processing unit 6 and is converted to a voice signal and a video signal of the base band. The video signal is modulated, amplified, etc. at the recording processing unit 7, and it is provided to the recording head 8, and recorded on the video tape 9. Although not shown, the voice signal is also provided to the voice head after being recorded and processed, and then recorded on the video tape 9.

On the other hand, the TV signal which is output from the intermediate frequency amplification unit 5 is provided to the additional signal separation unit 10, and the additional signal is separated. This additional signal is decoded by the micon 22 and stored in the storage unit 28, and the code number for this additional signal is provided to the recording and reproducing head 19 through the recording and reproducing processing unit 18, and recorded on the video tape 9.

Simultaneously with the recording of the TV signal, the control signal for tape running control during reproduction is provided to the control head 21 from the micon 22 through the control signal processing unit 20, and recorded on the video tape 9.

Next, during reproduction, the converting switch 14 is closed to the a side. The video signal modulated from the video tape 9 by the reproducing head 11 is reproduced, and processes such as modulating, amplifying and the like are performed at the reproducing processing unit 12. This video signal is output from the video output terminal 15 through the converting switch 14, and it is converted to a RF signal at the RF converter 16 and output from the RF output terminal 17.

Although not shown, the voice signal is also reproduced from the video tape 9, and a predetermined process is performed to be output. Moreover, a control signal is reproduced from the video tape 9 by the control head 21, and it is provided to the micon 22 through the control signal processing unit 20. Due to this, the micon 22 controls the running of the video tape 9.

On the other hand, when the converting switch 14 is closed to the b side, the micon 22 reads the decoded additional signal stored in the storage unit 28. These additional signals are converted to character signals representing the content of the additional signal at the character generating unit 13, and are output from the video output terminal 15 through the converting switch 14. Then, they are converted to RF signals at the RF converter 16 and output from the RF output terminal 17. Thus, the monitor (television receiver) which is not shown displays a table representing the content of the additional signals of each program recorded on the video tape 9, respectively. Herein, when the predetermined operation of the operational key unit 24 is performed and the desired program is designated from this table, the micon 22 reads the code number by the recording and reproducing head 19 and performs cueing of the designated desired program while rapidly running the video tape 9. Then the reproduction of the program is performed.

Next, the additional signal and its recording method are described.

Figure 2 shows a stored content of the storage unit 28 in Figure 1.

In the same diagram, one video tape is divided into a plurality of recordable areas, and indices A, B, C,..., P are sequentially provided to the respective recordable areas. Herein, a setting of 16 recordable areas at the maximum is possible, and a recording of 16 different programs is possible. Thus, 16 storage areas of the additional signals are provided to the storage unit 28, and indices A, B, C,..., P are sequentially stored, respectively. Therefore, in this case, if only 3 programs can be recorded on the video tape due to the standard speed mode and triple speed mode of the recording, or the recording time of the program, the storage unit 28 merely has additional signals stored in the 3 storage areas. Moreover, when 17 or more programs can be recorded, additional signals of 16 programs are stored in the storage unit 28. When recording a thirty minute program in a triple speed mode on a 160 minute video tape in

a standard speed, since 16 programs are recordable, it is sufficient by providing 16 additional signal storage areas in the storage unit 28. However, if necessary, more storage areas may be provided.

Code number is provided to each storage area of the storage unit 28. This code number is a hexadecimal number, and it is 0 for index A, 1 for index B, 2 for index C,..., and F for index P.

When recording one 1-hour program with an additional signal with a content of the program name being "□□□", the channel number being 6ch, and the broadcast date being May 1, 1988, the content of this additional signal and data representing one hour recording time (hereinafter, referred to as additional data) are stored in the storage unit 28. However, if this additional data is stored in the storage area of index A, the additional data of the program to be recorded next (program name "○○○", channel number 1ch, broadcast date May 2, 1988, recording time 2:00) is stored in the storage area of the next index B. Hereinafter, in the recording order, the additional data of each program is stored in the storage area of indices C, D,...

The code number is recorded in an area in which the program corresponding to the video tape is recorded instead of the additional data. Thus, the program with a content of additional data represented by index A is recorded in an area in which the code number 0 corresponding to this index A of the video tape is recorded.

In Figure 2, the storage areas of indices N, O and P are unused, and recording is not performed.

Figure 3 is a description diagram showing a recording method of the code numbers shown in Figure 2 with a video tape 9.

In the same diagram, the recording range (recording area) of each program of the video tape 9 is shown by dividing with dotted lines. The recording area B is the recording range of a program with a program name "○○○" represented by index B in Figure 2, and the recording area C is the recording range

of a program with a program name "△△△" represented by index C in Figure 2. In this video tape 9, thirteen programs of indices A-M shown in Figure 2 are recorded.

In each recording area, a double-digit hexadecimal number (hereinafter, referred to as recording code. With respect to this, in a case of a mere code number, it is referred to as the code number corresponding to each recording program shown in Figure 2) is recorded wherein the high order digits are the code numbers in Figure 2 for the programs recorded in the recording area, and the low order digits are all the code numbers shown in Figure 2 recorded on the video tape 9.

Herein, as shown in Figure 2, when indices A-M are provided to the video tape 9, respectively, and when the programs in which the respective code numbers corresponding to the indices are 0, 1, 2,..., C, are recorded, in Figure 3, in the recording area B in which the program of index B (code number 1) is recorded, recording codes 10, 11, 12,..., 1C are recorded, and in the recording area C in which the program of index C (code number 2) is recorded, recording codes 20, 21, 22,..., 2C are recorded.

In this way, by recording the recording codes for each recording area, when reproducing the recording codes, the programs recorded in the recording area can be known from the high order digit, and all programs recorded on the video tape 9 can be known from the low order digit.

Next, the portions indicated by reference numerals 23-27 in Figure 1 are described.

The power input detecting unit 23 does not detect on/off of the main power of the set main body. It detects that the set main body is in an operable status by an operation of a remote controller, power switch (not shown) and the like.

The operational key unit 24 is newly provided with a search key other than the operational keys such as rewind, stop, play, fast-forward and record keys similar to the conventional VTR. This search key is capable of having a new function by having the search key operate simultaneously with the conventional operational keys. When there are pause key, frame-advance key

and the like other than the conventional operational keys, they can be used as the search key.

The scheduling switch detecting unit 25 detects whether or not the set main body is in a program scheduling status. For example, if it is in a program scheduling status, signal "1" is transmitted to the micon 22, and if it is not in a program scheduling status, signal "0" is transmitted to the micon 22.

A scheduling date setting unit 26 sets the date of the scheduling recording. A cassette receiver detecting unit 27 detects whether or not the cassette is received in the set main body.

In Figure 1, the additional data stored in the storage unit 28 is stored at the head or end of the video tape 9, along with the code number and the index. That is, the table shown in Figure 2 is recorded on the video tape 9, and even if the video tape 9 is removed from the set main body, the heading recorded here is secured.

When designating and reproducing the desired program from the video tape 9 in which the program is recorded as described above, when the video tape 9 is installed into the set main body, firstly, a table is read from the head or the end of this video tape 9 and stored in the storage unit 28. Then, when the search key of the operational key unit 24 is operated, the micon 22 closes the converting switch 14 to the b side, and the index and the additional data are read from the storage unit 28 to transmit to the character generating unit 13. Due to this, as shown in Figure 4, the cursor 30 shown with diagonal lines and additional data for each index are displayed on the monitor screen 29.

That is, index A and its corresponding additional data of the program name "□□□", channel number "6ch", broadcast date "88.05.01" and recording time "1:00" are displayed in the area 31a surrounded by the dotted line. Similarly, the subsequent index B and additional data are displayed in the area 31b, and further, the subsequent index C and additional data are displayed in the area 31c, respectively. Cursor 30 is

displayed at the index display positions of each areas 31a-31c. The desired program can be designated by this cursor 30.

Next, an example of a designating method of the desired program is described by Figures 4 and 5. In Figure 5, 31 is a rewind key, 32 is a stop key, 33 is a play key, 34 is a fast-forward key, 35 is a record key, and 36 is a search key which is newly provided. Although search keys 31-35 have similar functions as the operational keys of the conventional VTR, they can have new operational functions by using them together with the search key 36. 37 is an eject key of the received cassette.

In Figure 5, as shown in (1), when the rewind key 31 and the search key 36 are simultaneously operated, the cursor 30 shown in Figure 4 moves upward on the screen 29. For example, when the cursor 30 is on index C of the area 31c, if the rewind key 31 and search key 36 are operated, the cursor 30 moves to index B. Moreover, as shown in (2), when the fast-forward key 34 and search key 36 are simultaneously operated, the cursor 30 moves downward on the screen 29.

Figure 4 displays three additional data. In this case, when the cursor 30 is on index C, if the fast-forward key 34 and search key 36 are simultaneously operated, the shift of the cursor 30 is not performed, and the index and additional data are scrolled upward. Thus, index B and the additional data are displayed in area 31a on the screen 29, and indices C, D and the additional data are displayed in areas 31b and 31c, respectively. Further, when the fast-forward key 34 and search key 36 are simultaneously operated, indices C, D, E and the additional data are displayed on the screen 29, in an order from the top. When this operation is consecutively performed, indices and additional data are sequentially scrolled from bottom to top.

Herein, if the content shown in Figure 2 is recorded on the video tape 9, index A is displayed subsequent to index M on the screen 30 since there is nothing recorded after index N. That is, indices, A, B, C...M are displayed in circulation as in A, B, C...M, A, B, C. This operation is the same even

when fixing the cursor 30 in area 31a and simultaneously operating the rewind key 31 and search key 36.

The program desired to be reproduced is searched from the program names displayed on the screen 29 by the simultaneous operation of the rewind key 31 and search key 36 or fast-forward key 34 and search key 36. After matching the cursor 30 to index A by having the desired program as the program of the program name "□□□" in Figure 4, when the play key 33 and search key 36 are simultaneously operated as shown in (3) in Figure 5, the micon 122 reads the designated code number "1" for index A from the storage unit 28, in Figure 1. Along with that, the micon 122 rewinds or fast-forwards the video tape 9, compares the high order digit of the recording code reproduced by the recording and reproducing head 19 with the code number from the storage unit 28, continues to search until the two match to cue the desired program on video tape 9. Then, the operation is shifted to the reproducing operation of the program.

When the rewind key 31, play key 33 and fast-forward key 34 in Figure 5 are individually operated, they have the same function as the previous one. For example, in the operation of only the play key 33, a reproduction is immediately started from the location where the video tape 9 is contacting the reproducing head 11.

In the aforementioned description, a search key was newly provided and there is no complication in the operation of the special functions. However, even if a new key is not provided, the aforementioned special functions are possible by using the various keys redundantly. Moreover, if there is a pause key, frame-advance key and the like other than the operational keys shown in Figure 5, these keys can be used as the search key.

Next, the aforementioned searching method will be described in more details with respect to Figure 6. Herein, in order to simplify the description, three programs are recorded on the video tape.

In the same figure, the program with the program name "□□□" and index A shown in Figure 2 is recorded in the recording

area A of the video tape 9, the program with the program name "○○○" and index B is recorded in the recording area B, and the program with the program name "△△△" and index C is recorded in the recording area C, respectively. Thus, each index and additional data are displayed on the monitor screen as shown in Figure 4. Moreover, recording codes 00, 01, 02 are recorded in the recording area A on the video tape 9, recording codes 10, 11, 12 are recorded in the recording area B, and recording codes 20, 21, 22 are recorded in the recording area C, respectively.

Herein, as shown in the figure, the recording and reproducing head 19 is located in the recording area B. In this case, when only the play key 33 (Figure 5) is operated, the program of the program name "○○○" is reproduced. With respect to this, if the program of the program name "△△△" is desired to be reproduced, as described above, the cursor 30 on the screen 29 is moved by using the search key 36 and rewind key 31 or fast-forward 34, and after matching this cursor 30 with index C of the program of the program name "△△△", the search key 36 and play key 33 may be simultaneously operated. The micon 22 (Figure 1), firstly, reads the recording code from the video tape 9 by the recording and reproducing head 19 and detects which program is recorded in the recording area of the video tape 9 in which the recording and reproducing head 19 is located. Then, the recording and reproducing head 19 reproduces the recording code from the video tape 9, searches the recording code in which the high order digit and the low order digit match, and the high order digit or the low order digit of this recording code is the code number representing the content of the program recorded in the recording area of the video tape 9 in which the recording and reproducing head 19 is currently existing. Thus, in the case of Figure 6, firstly, the recording area of the program of the program name "○○○" represented by index B corresponding to code number 1 is found out.

Since the code number of the program desired to be reproduced of index C is 2, next, the micon 22 determines that

the program desired to be reproduced is recorded towards the end, from the reproduced code number 1. Then, the video tape 9 is fast-forwarded while searching the recording code. The micon 22 compares the high order digit of the recording code from the recording and reproducing head 19, i.e., the code number, with the code number of the desired program, and when the two match, the fast-forwarding is stopped and the reproducing operation is started.

The recording and reproducing head 19 is at a location shown in Figure 6, and as shown in Figure 4, when index A is indicated and the reproduction of the program in the recording area A is desired, similar to the above, the micon 22 detects the recording code at the current location and determines the code number of its high order digit. Since this code number is 1 and the code number 0 of the desired program of index A is smaller, the micon 22 detects the code number from the recording code being reproduced while rewinding the video tape 9. The video tape 9 is further rewound even if this code number matches the code number of the desired number, and the rewinding stops at the point when the code number to be reproduced is changed. This stop point is the start point of the recording area A, and the reproduction starts here.

When summarizing the aforementioned searching procedures, it is as follows. First, the matching of the high order digit and the low order digit of the double-digit recording code which is recorded in the recording area of the video tape 9 in which the recording and reproducing head 19 is contacting is detected to determine the recorded code number. When the code number is larger than the code number of the program desired to be reproduced, the video tape 9 is fast-forwarded and searched. When the target code number is detected, reproduction is immediately performed. Reversely, when the code number of the program desired to be reproduced is smaller than the aforementioned code number first detected, the video tape 9 is rewound and searched. At this time, even if the target code number is detected, rewinding is performed until this target

code number is changed to another code number. Then, the reproducing operation is performed.

As described above, additional signals for each program are stored on the video tape as a table. Since code numbers are recorded for each program, the display of this table is possible at anytime, and the selection of the desired program can be easily performed. A search of the desired program is automatically performed by using code numbers, and the convenience is largely improved.

Next, the entire operation of the present invention is described in Figures 7 and 8.

Figure 7 is a flow chart with an operation of scheduling recording as the main operation.

In the same figure, step (A) is a main process routine shown in Figure 8 which will be described later. After performing this step (A), the micon 22 (Figure 1) determines whether or not the program is scheduled by the output of the scheduling switch detecting unit 25 (Figure 1) (step (B)). If the scheduling is not performed, the process is returned to step (A). If the program is not scheduled, the scheduled time set in the scheduling date setting unit 26 and the actual time (actual time) are read (step (C)), and it is determined whether or not the two are matched (step (D)). If the two do not match, the process is returned to step (A).

When the scheduled time and the actual time match, the recording does not immediately start as in the conventional VTR. Instead, the time difference (hereinafter, referred to as offset time) is calculated between the actual broadcast time and the broadcast scheduled time of the program indicated in the program column of newspapers and the like included in the additional signal of the TV signal tuned by the tuner 3 (Figure 1). Otherwise, it is possible to include this offset time in the additional signal of the TV signal, and the offset time is calculated from this additional signal (step (E)). Herein, when it is the broadcast scheduled time of the scheduled program, the micon 22 controls the tuning unit 4 such that the tuner 3 selects the

channel number of this program. For example, when it is the broadcast scheduled time for the program of the program name "□□□" and channel number "6ch", the tuner 3 is set to tune to channel number "6ch". At this time, if there is no delay in the broadcast in this "6ch", the program of the program name "□□□" is tuned by the tuner 3, and this matter is determined by the matching of the actual time and the broadcast scheduled time included in the additional signal of this TV signal. However, if there is a difference (i.e., offset time) between the actual time and the broadcast scheduled time included in the additional signal of the program of "6ch" tuned by the tuner 3, each program of this "6ch" is broadcasted later than as scheduled by the offset time. Thus, the program of the program name "□□□" is also broadcast with a delay by only the offset time when compared to the broadcast scheduled time.

In this way, when the offset time is calculated (step (E)), next, it is determined whether or not the offset time is zero or not (step (F)). If it is not zero, it is determined whether or not this offset time is within 5 hours (step (G)). The offset time is usually approximately within 2 hours, and when it goes beyond 5 hours, it may be considered as broadcast cancellation. Therefore, when the offset time goes beyond 5 hours, the scheduling of this program is cancelled (step (H)), and the process returns to step (A). When the offset time is within 5 hours, the scheduled time set in the scheduling date setting unit 26 of this program is reset by shifting by the offset time.

In this way, even if the broadcast time of the program is mismatched, recording can be performed without missing the program.

When the offset time is determined as zero in step (F), the content of the additional signal of the TV signal (program name, etc.) is read (step (J)) and is stored in the storage unit 28 (Figure 1) as the additional data along with the recording time (step (K)). At this time, the index and the code number are also added and stored. This recording time is calculated from the scheduled broadcast start time and the broadcast end

time. Next, the micon 22 actuates the recording processing unit 7 (Figure 1) and starts the recording of the program to the video tape 9 (Figure 1). Along with this, as described in Figure 3, a recording of the hexadecimal number double-digit recording code is performed (step (L)). At this time, since the required code number can be known from the number of programs being scheduled, the low order digit of the recording code is created by this. This recording operation is performed until the scheduled recording end time of this program, and when it is this time, the recording ends and returns to step (A).

Next, the main process routine of step (A) in Figure 7 is described by Figure 8.

Firstly, it is determined whether the power is on or off by the output of the power input detecting unit 23 (Figure 1) (step (a)). When the power is on, it is determined whether or not the tape cassette is received by the output of the cassette receiver detecting unit 27 (Figure 1) (step (b)). This output is "1" when the tape cassette is received and "0" when the tape cassette is not received. When the tape cassette is not received, the cassette flag is reset and returns to step (A) in Figure 7.

When the tape cassette is received, it is determined whether the cassette flag is set (step (c)). This is for detecting whether the tape cassette was received now or whether it was received previously. If the tape cassette was received now, the cassette flag is reset, and if it was received previously, the tape cassette is set.

If the tape cassette was received now, the cassette flag is set (step (e)). The video tape is rewound or fast-forwarded, and the table shown in Figure 2 of the additional data, index and code number stored at the head or end of the video tape is read and stored in the storing unit (step (f)). Subsequently, as shown in Figure 4, these indices, additional data and cursor are displayed on the monitor screen (step (g)).

As described above, when the tape cassette is installed in the set main body, the index and the additional data of the

program recorded on the video tape are immediately displayed on the monitor along with the cursor.

In this way, the tape cassette is installed in the set main body, and the display shown in Figure 4 is performed. Then, when none of the operational keys of the operational key unit 24 is operated (step (h)), the process proceeds to step (C) in Figure 7. With respect to this, if any of the operational keys is operated (step (h)), it is determined whether or not this operational key is an eject key 37 (Figure 5) (step (k)). If it is not an eject key, this operational key is determined, and the process proceeds to an operational key determination routine which performs the corresponding operation (step (i)). This operational key determination routine performs usual operations such as recording, reproducing and the like by the search key or search operation by a search key described in Figure 5 and other operational keys. When these operations end, the process proceeds to step (B) in Figure 7. When it is determined that eject key 37 was operated in step (k), the video tape 9 is rewound or fast-forwarded, and the table shown in Figure 2 stored in the storing unit 28 (Figure 1) at the head or end of the video tape 9 is recorded (step (l)). Then, the process proceeds to step (B).

If the tape cassette was previously installed in the set main body and the cassette flag is set (steps (b) and (c)), a display of Figure 4 is made when the search key 36 (Figure 5) is operated (step (g)). Then, the process proceeds to step (h). When the search key 36 is not operated, the process directly proceeds to step (h). Then, the further descriptions are performed by steps (h), (k), (i) and (l), and the process proceeds to step (B) in Figure 7.

The point of the operation shown in Figure 8 is to determine whether the tape cassette was newly received or whether it was previously received, and when it was newly received, the aforementioned table information recorded on the video tape of the tape cassette is once read and stored in the storing unit 28 (Figure 1), and another point of the operation is to use this

table information for program search. Due to this, the operability of the magnetic recording and reproducing device is largely improved.

Figure 9 shows another specific example of a recording unit which records the table of programs recorded on the video tape. 38 is the casing of the tape cassette, 39 is a hub for winding the tape, 40 is a video tape, 41 is a tab for deletion prevention, and 42-44 are magnetic tapes.

This specific example is provided with a recording unit at the exterior of the tape cassette. One example of this includes a magnetic tape. Figure 9(a) shows an example in which a magnetic tape 42 is attached on the top of the tape cassette 38 as the recording unit, perpendicular to the loading direction (arrow) of the tape cassette 38. Figure 9(b) shows an example in which magnetic tapes 43 and 44 are attached on the top and at the side of the tape cassette 38, in a direction same as the loading direction (arrow). In this way, when the recording unit is provided to the exterior of the tape cassette, the time required for writing and reading the table of the content recorded on the tape cassette is shortened by obviating the rewinding, fast-forwarding and the like, when compared with the method for recording the table of programs recorded at the head or end of the video tape 40 inside the tape cassette 38. Moreover, the attachment position of the recording unit can be anywhere else than as described above. It is also possible to attach at the back of the protective cover of the video tape.

In Figure 9, although each of the magnetic tapes 42-44 were used instead of the recording areas of the table shown in Figure 2 at the head or end of the video tape, they can also be used instead of the storage unit 28 in Figure 1. In this case, the magnetic tapes 42-44 also have regions in which the table is recorded for storing. Thus, it is unnecessary to transfer the table to another recording area from the storage unit for storing.

As described above, since the head or end of the video tape or the magnetic recording mediums such as magnetic tapes

42-44 shown in Figure 9 are used for storing the table, the rewriting of the data recorded thereon is possible. Thus, when the recording program is changed in the area where the video tape exists, only the corresponding additional data is changed. Actions for the change in recording content can be easily performed.

[Effects of the Invention]

As described above, according to the present invention, together with the program recording onto the video tape, the additional data is automatically created, and the table of the recorded program is created along with the code number and index. Also, the corresponding loading program is recorded in the recording area of the recording program. Thus, the work for the setting operations of the data for program search is reduced, and there is no error since the data which is set is not created by a human. The operability and reliability of the program search is greatly improved.

Moreover, even if there is a change in the broadcast time of the recording scheduled program, the recording time is automatically changed according to this. Thus, once the recording is scheduled, the program is recorded without any errors, and the reliability of the recording scheduling is greatly improved.

4. Brief Description of the Drawings

Figure 1 is a block diagram showing an example of a magnetic recording and reproducing device of the present invention. Figure 2 is a diagram showing a table example of the additional data for each program recorded on the video tape in Figure 1. Figure 3 is a diagram showing a recording example of the code numbers on the video tape in Figure 1. Figure 4 is a diagram showing a display example for a search of the table shown in Figure 2. Figure 5 is a diagram showing an operational example for a program search at the operational key unit in Figure 1. Figure 6 is a diagram showing a searching method of a desired

recorded program of the video tape of the example shown in Figure 1. Figures 7 and 8 are flow charts showing the operations of the examples shown in Figure 1. Figure 9 is a perspective diagram showing an example of a tape cassette used in this example.

3...tuner 7...recording processing unit
8...recording head 9, 40...video tape
10...additional signal separation unit
11...reproducing head 12...reproducing processing unit
13...character generating unit
14...converting switch
18...recording and reproducing processing unit
19...recording and reproducing head
22...microcomputer 24...operational key unit
25...scheduling switch detecting unit
26...scheduling date setting unit
28...storage unit

Figure 1

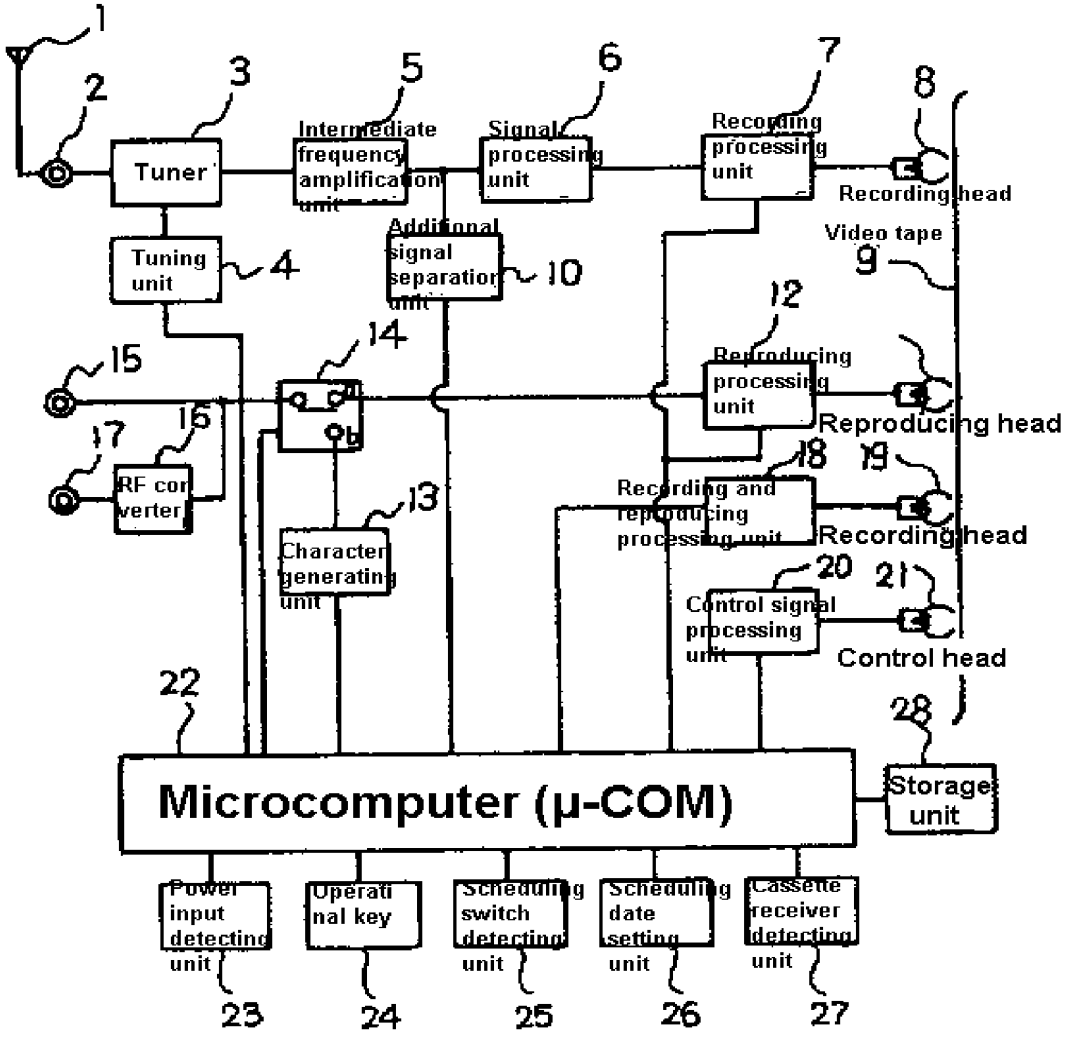

1
2
3
5
6
7
8
Tuner
Intermediate frequency amplification unit
Signal processing unit
Recording processing unit
Recording head
Video tape
9
Tuning unit
4
Additional signal separation unit
10
12
14
15
Reproducing processing unit
Reproducing head
17
16
RF converter
18
19
Recording and reproducing processing unit
Recording head
13
Character generating unit
20
21
Control signal processing unit
Control head
22
28
Microcomputer (μ-COM)
Storage unit
Power input detecting unit
Operational key
Scheduling switch detecting unit
Scheduling date setting unit
Cassette receiver detecting unit
23
24
25
26
27

Figure 2

Code No.	In dex	Program name	Channel No.	Broadcast date	Recording time
0	A	□ □ □	6 ch	88.05.01	1 : 00
1	B	○ ○ ○	1 ch	88.05.02	2 : 00
2	C	△ △ △	10 ch	88.05.15	0 : 30
C	M	⊠ ⊠ ⊠	3 ch	88.05.30	1 : 30
D	N				
E	O				
F	P				

Figure 3

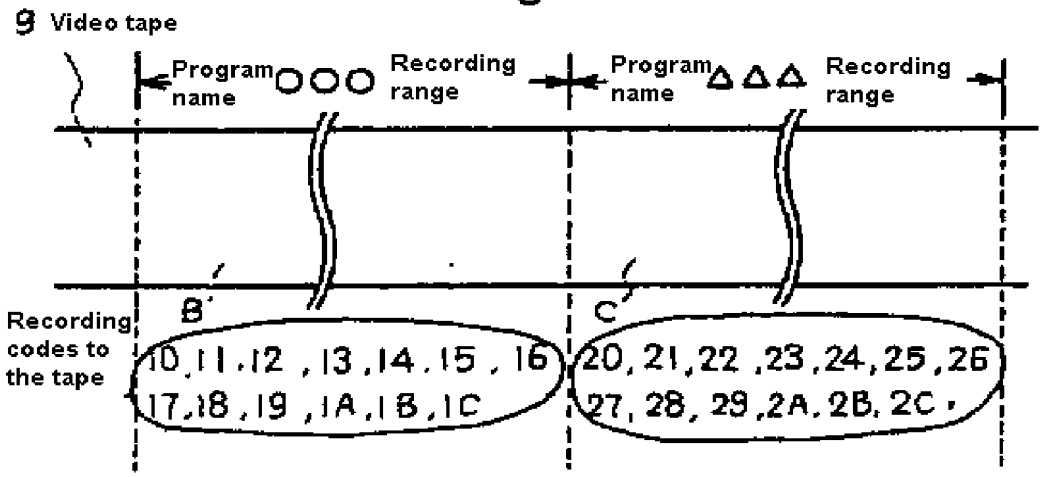


Figure 4

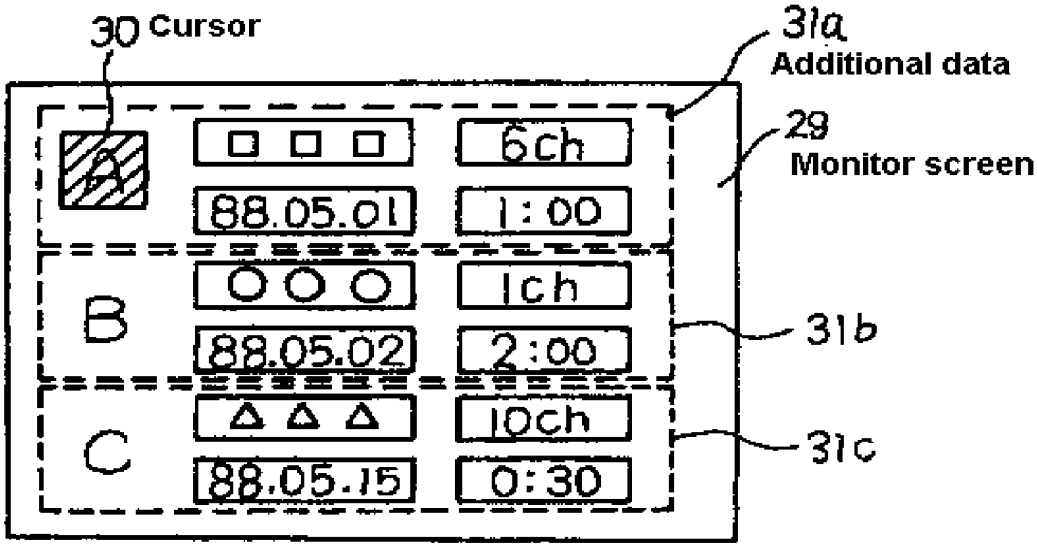


Figure 5

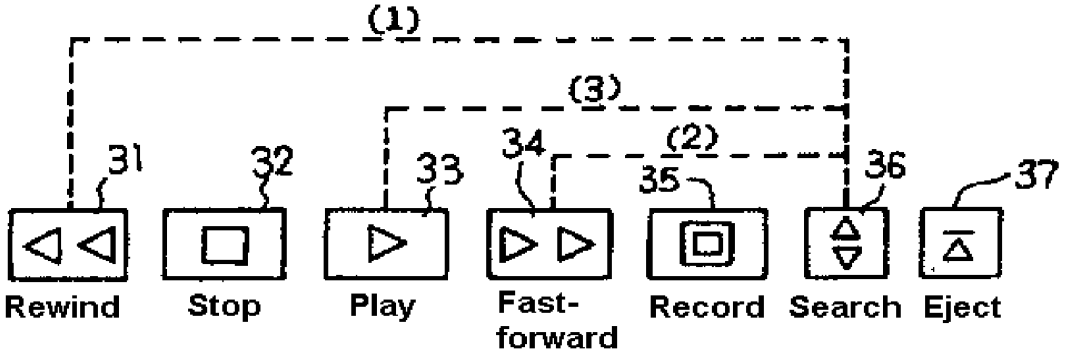


Figure 6

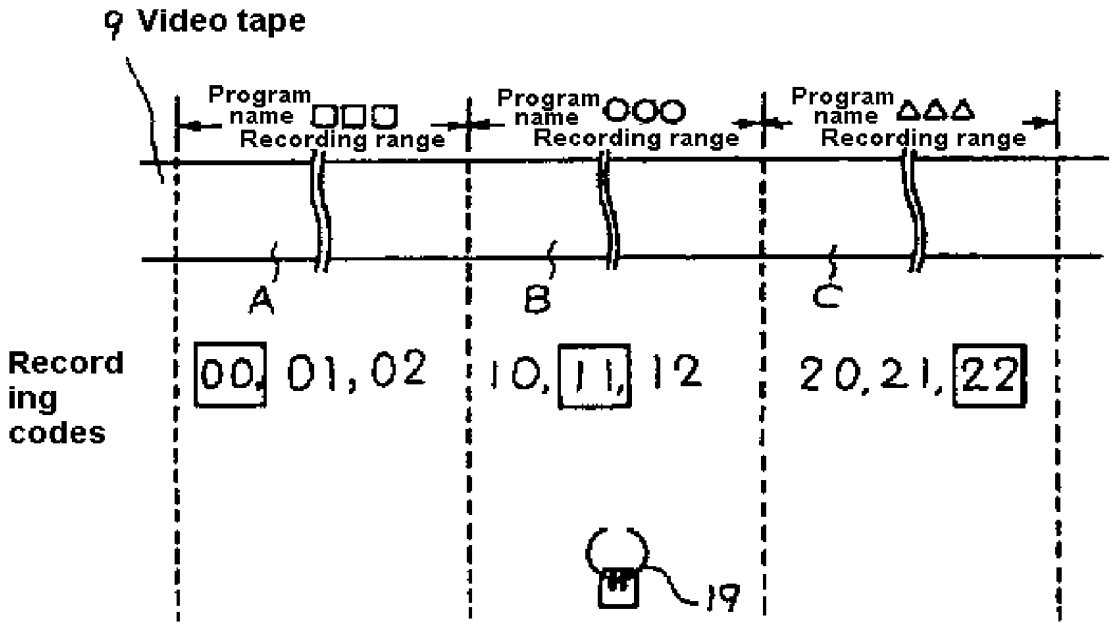

9 Video tape
Program name □□□
Recording range
Program name ○○○
Recording range
Program name △△△
Recording range
A
B
C
Recording codes
00, 01, 02
10, 11, 12
20, 21, 22
19

Figure 7

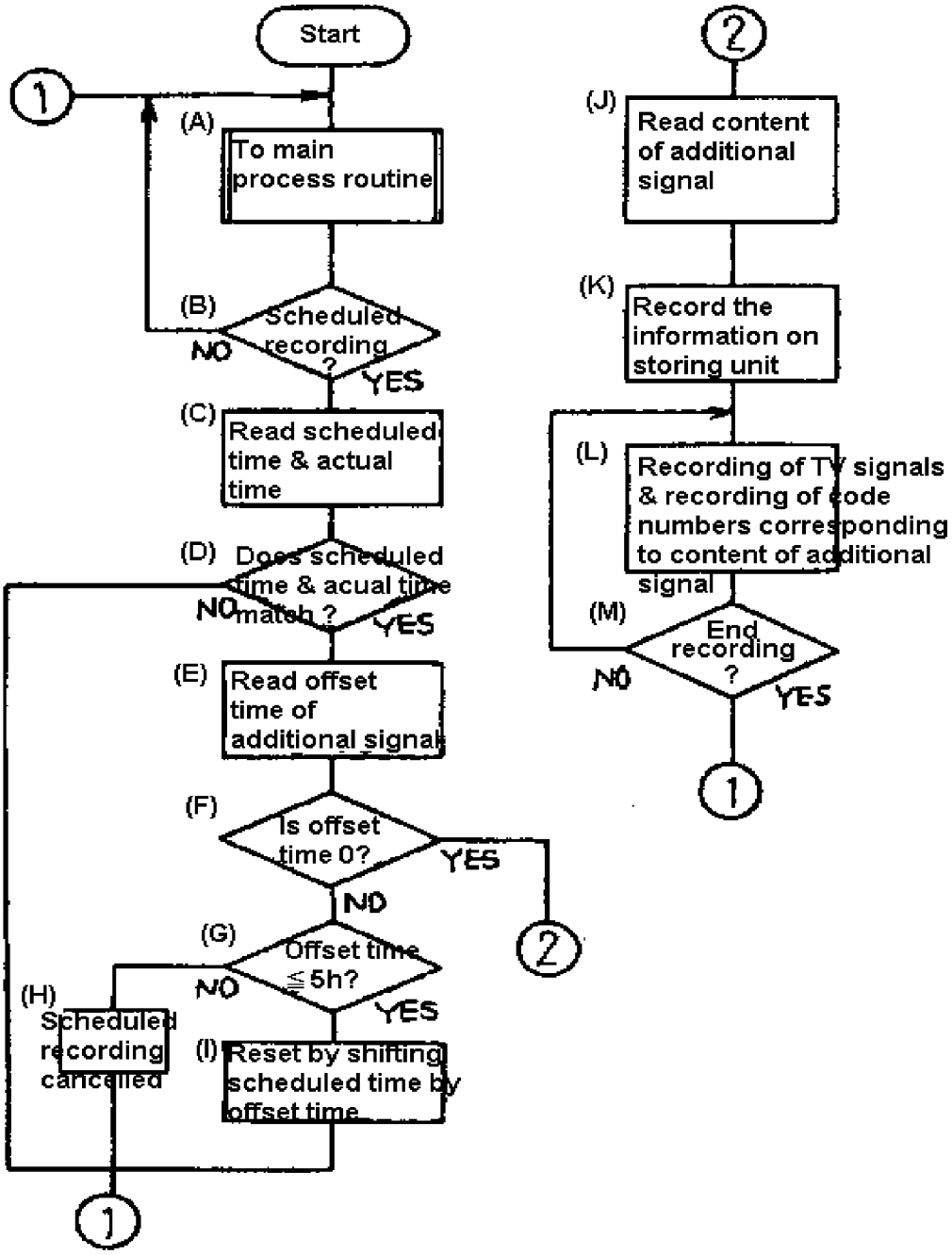

Start
1
(A)
To main process routine
(B)
Scheduled recording ?
NO
YES
(C)
Read scheduled time & actual time
(D)
Does scheduled time & acual time match ?
NO
YES
(E)
Read offset time of additional signal
(F)
Is offset time 0?
YES
NO
2
(G)
Offset time ≦5h?
NO
YES
(H)
Scheduled recording cancelled
(I)
Reset by shifting scheduled time by offset time
1
2
(J)
Read content of additional signal
(K)
Record the information on storing unit
(L)
Recording of TV signals & recording of code numbers corresponding to content of additional signal
(M)
End recording ?
NO
YES
1

Figure 8

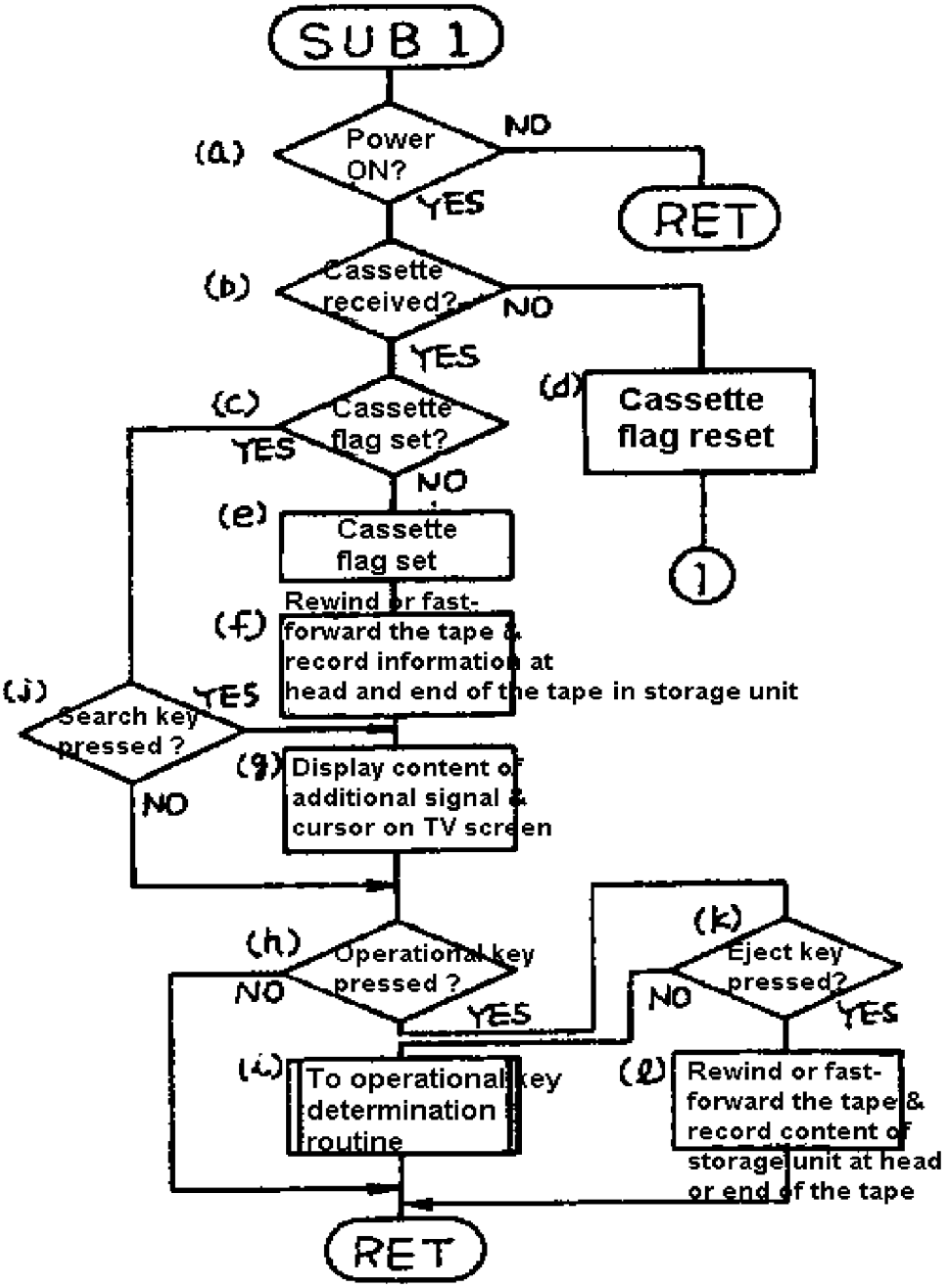
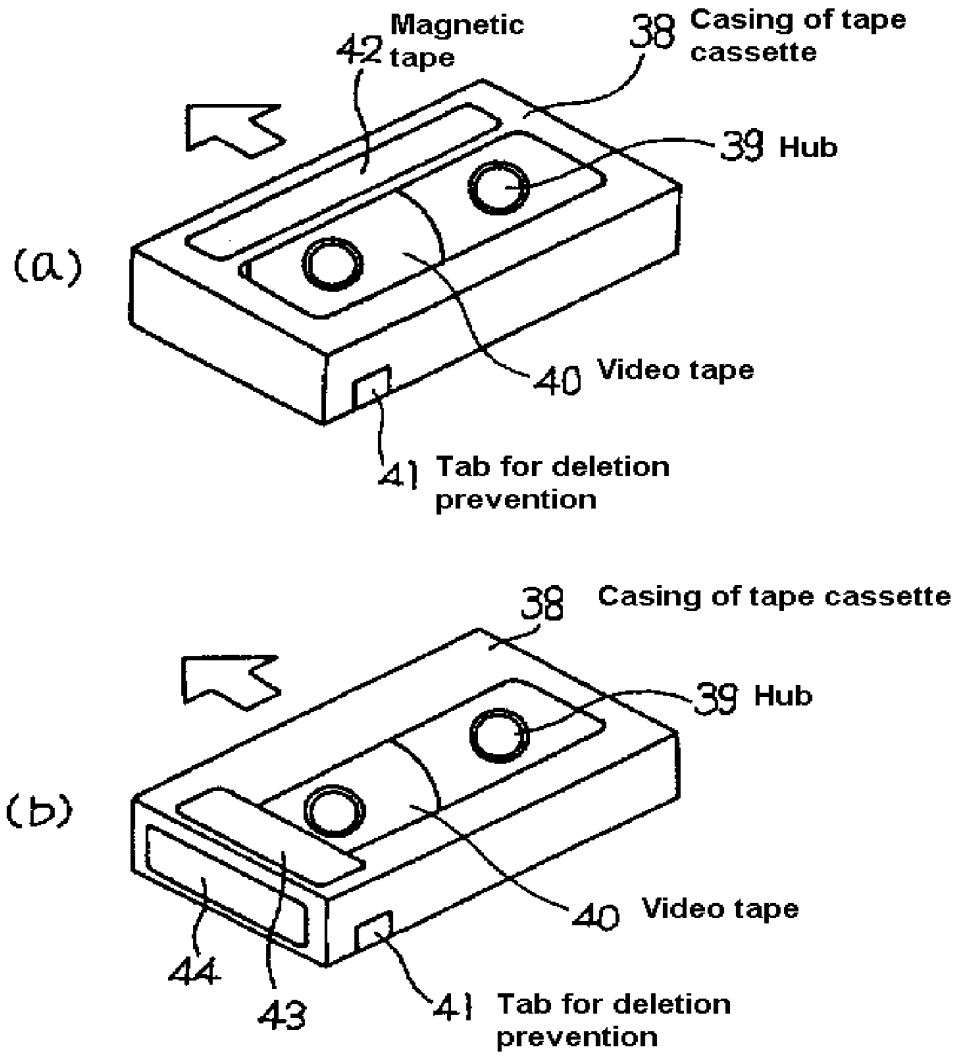

SUB 1
(a)
Power ON?
NO
YES
RET
(b)
Cassette received?
NO
YES
(c)
Cassette flag set?
YES
NO
(d)
Cassette flag reset
1
(e)
Cassette flag set
(f)
Rewind or fast-forward the tape & record information at head and end of the tape in storage unit
(j)
Search key pressed ?
YES
NO
(g)
Display content of additional signal & cursor on TV screen
(h)
Operational key pressed ?
NO
YES
(k)
Eject key pressed?
NO
YES
(i)
To operational key determination routine
(l)
Rewind or fast-forward the tape & record content of storage unit at head or end of the tape
RET

Figure 9


(a)
42 Magnetic tape
38 Casing of tape cassette
39 Hub
40 Video tape
41 Tab for deletion prevention
(b)
38 Casing of tape cassette
39 Hub
40 Video tape
44
43
41 Tab for deletion prevention